

# HOMOEPITAXIAL GALLIUM NITRIDE BASED PHOTODETECTOR AND METHOD OF PRODUCING

## ABSTRACT OF THE INVENTION

**[0068]** A photodetector comprising a gallium nitride substrate, at least one active layer disposed on the substrate, and a conductive contact structure affixed to the active layer and, in some embodiments, the substrate. The invention includes photodetectors having metal-semiconductor-metal structures, P-i-N structures, and Schottky-barrier structures. The active layers may comprise  $\text{Ga}_{1-x-y}\text{Al}_x\text{In}_y\text{N}_{1-z-w}\text{P}_z\text{As}_w$ , or, preferably,  $\text{Ga}_{1-x}\text{Al}_x\text{N}$ . The gallium nitride substrate comprises a single crystal gallium nitride wafer and has a dislocation density of less than about  $10^5\text{cm}^{-2}$ . A method of making the photodetector is also disclosed.